

German mine yields ancient hunting spears

Excavations in the depths of a German coal mine have bagged the archaeological equivalent of really big game—the world's oldest known hunting weapons, a trio of wooden spears fashioned with admirable skill by apparently dedicated meat eaters as many as 400,000 years ago.

Investigators led by Hartmut Thieme of the Institute for the Preservation of Historical Monuments in Hannover, Germany, found the spears—which range in length from 6 to 7 feet—lying among stone implements and animal bones, including the butchered remains of more than 10 horses.

"This offers strong reason to suspect that the spears were used for hunting rather than simply driving predators away from carcasses," Thieme holds. His description of the discoveries appears in the Feb. 27 *NATURE*.

Thieme initiated archaeological work at the Schöningen mine in 1983. Extensive coal mining there had revealed soil layers bearing artifacts of great antiquity. The researchers were unprepared, though, for encountering well-preserved hunting weapons.

Many theorists had maintained that big-game hunting emerged about 100,000 years ago, at most. The only specimens

comparable to the Schöningen material are a 125,000-year-old wooden shaft found inside an elephant skeleton at another German site in 1948 and a 400,000-year-old stone tip—perhaps part of a spear—unearthed in England in 1911.

Some scientists interpreted these discoveries as either digging sticks or probes for locating snow-covered carcasses.

"But the Schöningen discoveries are unambiguously spears," writes archaeologist Robin Dennell of the University of Sheffield in England in an accompanying comment. "To regard them as snow-probes or digging sticks is like claiming that power drills are paperweights."

Spear making required careful planning, Thieme notes. Each weapon consists of the trunk of a 30-year-old spruce tree with the bark removed. Tips were sharpened at the base of the trunk, where the wood is hardest. The thickest and heaviest part of the carved shaft is about one-third of the distance from the spear point, as in a modern javelin.

These spears were made for throwing at animals from a distance, not for thrusting into their bodies at close range, according to Thieme.

Of the animal bones at the site, most of

them from horses, many have incisions and fractures typically produced during butchery, the German archaeologist says. The material probably dates to 400,000 years ago, based on its position in a soil layer sandwiched between deposits of previously identified ice ages, he adds.

Human ancestors may have weathered northern Europe's frigid climate as many as 500,000 years ago, thanks to their hunting proficiency, Dennell suggests. England's Boxgrove quarry contains butchered animal remains from that time (SN: 1/4/97, p. 12).

"I wouldn't be surprised to find spears at Boxgrove like those at Schöningen," remarks Mark B. Roberts of University College, London, who directs the Boxgrove project. "Still, I'm amazed at the advanced technology displayed in the German weapons."

In the absence of age estimates from any absolute dating techniques, Roberts says that the new finds may be only 350,000 years old.

No human or humanlike fossils have been found at Schöningen, leaving unclear the identity of the spear makers. Thieme regards them as *Homo erectus*, Roberts tentatively assigns them to an early version of *H. sapiens*, and Christopher B. Stringer of the British Museum in London thinks they may have been predecessors of Neandertals. — B. Bower

Clockwork sex of coral reef algae

Birds and bees do it—and we know in fairly intimate detail how they do it—but sexual reproduction among algae is often a secretive, little-studied affair. Cryptogams, they have been called, because of their hidden sex lives. Now, a chance observation by a fish ecologist sheds new light on how algae in a group important to coral reefs get their gametes together.

The insight had a lot to do with being in the right place at the right time: the coral reefs off Panama at 5 a.m. Kenneth E. Clifton and his coworkers at the Smithsonian Tropical Research Institute went snorkeling each morning to monitor fish reproduction on the reef. On one of the dives, Clifton says he "saw these algae smoking," puffing out plumes of milky green cells.

After more than a year of studying the algae and timing their eruptions, Clifton pieced together the first detailed picture, reported in the Feb. 21 *SCIENCE*, of how the algal community organizes sexual reproduction. "Most of these kinds of events, if they are studied at all, are only studied in the lab," says Mark Hay, a marine algae specialist at the University of North Carolina at Chapel Hill. "This is a huge step forward."

Commonly called seaweed, the algae

sprawl and drape on and around coral reefs worldwide. They often show up on satellite images. As photosynthesizers, they are food for the reef organisms. Some species cut down on this predation with an internal, shell-like structure of calcium carbonate that may interfere with digestion in fish, says Clifton, now at the University of California, Santa Cruz.

Like plants, the algae can reproduce asexually. But more frequently than marine biologists had realized, these algae reproduce sexually, in a quick, tightly choreographed exchange at dawn.

Unlike most plants—but like spawning salmon—the algae's sexual exchange marks the end of the individual. Overnight, a seaweed develops grapelike clusters or other reproductive structures. Then, the organism streams into the structures, and the entire mass is discharged as gametes 24 hours later. The males of each species go first, followed within minutes by the females. Clifton noted "spawning" by different individuals within a species every few days.

"The water turns green, you can't see anything, and 15 minutes later it's over," he says. Waves break up the calcified remains, destined for a sandy beach. The fused cells settle on the reef.

As impressive as the clockwork of the sexes within a species, says Hay, is the evolutionarily important difference in timing among species. "Closely related species are partitioning out this narrow band of time in the morning so that they're not overlapping with each other" and thus not interbreeding.

What accounts for the timing? "It's a wide-open question," says Clifton, although light probably plays a part. Females kept "in solitary confinement" in a bucket still go off within a few minutes of their mates on the reef. — C. Mlot



Green algae on a coral reef. At the end of its vegetative life, the pealike alga transforms into a latticework of sex cells that are discharged through a white tube (upper right of insert), which sprouts just before release.